

*PATENT*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

**TITLE**

Visual Position Indicator For Valves With Linear Moving Valve Stem

**RELATED APPLICATION**

[0001] This is a continuation-in-part of patent application Serial No. 10/106,227, filed October 31, 2001.

**FIELD OF THE INVENTION**

[0002] The present invention relates to an apparatus for visually indicating the open and closed position of a valve having a linear moving valve stem.

**BACKGROUND OF THE INVENTION**

[0003] It is often difficult to determine at a glance whether a valve is open or closed. This problem is of particular concern in consumer goods, such as with valves on propane gas tanks, where harmful gases could escape without notice and potentially cause serious injury. Known types of indicating devices are generally not well suited for use in valve-containing consumer goods because these indicators are typically integrated with the valve assembly and/or contain a number of moving parts which increase the possibility of malfunction and also increase the cost of production.

[0004] Known inventions include those in which the valve indicator is part of the valve handle assembly. For example, U.S. Patent No. 3,910,308 describes a valve indicator consisting of a knurled valve handle having windows that expose an on/off color indicator of an interior ring operating by means of a spring and ball bearing mechanism.

[0005] Other known indicator devices function by attachment to the valve stem or actuator stem. U.S. Patent No. 5,469,805 discloses a valve position indicator fitted to the drive shaft of a valve actuator. The indicator has a sleeve interposed between an inner cylinder and an outer cylinder and arranged such that rotation of the actuator rotates the inner cylinder and

causes the sleeve to slide between the inner and outer cylinders allowing a different color to be visible when the valve is open or closed.

[0006] Another known mechanism of operation for valve position indicators is by attachment of the indicator to the valve bonnet. U.S. No. Patent 2,485,942 discloses an indicator comprised of contrasting color vanes, one affixed to the valve bonnet and the other responsive to valve stem movement. When the valve stem is moved, one vane slides over the other to indicate whether the valve is open or closed.

[0007] Each of the aforementioned inventions illustrates the disadvantages of known mechanisms for valve position indicators. These indicators operate by use of moving parts, which are additional to the valve mechanism itself. Additional moving parts not only increase costs of production, but could also potentially fail, leading possible error on the part of the operator and the need to replace the entire valve assembly.

#### **SUMMARY OF THE INVENTION**

[0008] The present invention is directed to a valve indicator wherein the open/closed position of the valve is indicated by the visible appearance of one or two bands below the hand wheel on a linear moving valve stem. Although the present invention will be described with particular reference to propane gas tank valves, it will be appreciated that the invention has broader applications and may be used with other types of valves having a valve stem that moves linearly from the open to closed position and/or in other environments. The valve indicator is for a multi-turn rotary valve, with linear moving stem. The invention is comprised of a hand wheel assembly with a hand grip having peripheral sidewalls and a downward depending annular sleeve wherein the hand wheel assembly is attached to a linear moving valve stem which operates to open and close the valve. A grommet is attached to and rests on the valve bonnet adjacent to the point where the valve stem enters the valve bonnet. As the valve is closed, the length of the valve stem shortens, drawing the annular sleeve of the hand wheel assembly down over the grommet to obscure one or more layers of the grommet's bands from vision, indicating that the valve is in the closed position. As the valve is opened, the length of the valve stem becomes longer, moving the annular sleeve of the hand wheel away from the grommet, thus

exposing one or more layers of the grommet's band, indicating that the valve is in the open position. The grommet has a breakaway portion defined by a groove adjacent the periphery of the grommet, and disposed at least partially within the vertical plane of travel of the sidewalls. A connector portion in the bottom of the groove for connecting the grommet to the breakaway portion serves as a shear point. Also, an opening in the grommet has a gripping means on an inner surface adjacent the valve bonnet.

[0009] In a preferred embodiment, the indicating means of the present invention is utilized in a propane gas tank valve.

[0010] It is an object of the present invention to provide a safety feature that allows part of the visual indicating means to breakaway if blocked, so that it will not interfere with positive closure of the valve.

[0011] It is also an object of the present invention to provide a surface of the inner radius of the grommet that allows the grommet to be pressed vertically downward along the valve body, and resists being pulled vertically upward on the body.

[0012] It is an object of the present invention to provide a visual signal on a valve to indicate that a valve is open or closed.

[0013] It is a further object of the present invention to provide an indicator that is advantageously suited for use in consumer goods containing valves.

[0014] It is an additional object of the present invention to provide an inexpensive means to provide a visual valve position indication.

[0015] It is another object of the present invention to provide visual position indicating means on a valve without the addition of moving parts to facilitate manufacturing.

[0016] It is yet another object of the present invention to enhance the safety of a manual valve by providing visual indication of the valve open position.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0017] The presently preferred embodiment of the invention is disclosed in the accompanying drawings wherein:

[0018] FIG. 1 is a cross-sectional elevational view of an upper portion of a valve assembly having the features of the present invention incorporated therein;

[0019] FIG. 2 is bottom plan view depicting the features of the present invention;

[0020] FIG. 3 is a perspective view of the valve position indicator in a valve closed position;

[0021] FIG. 4 is a perspective view of the valve position indicator in a valve open position.

[0022] FIG. 5 is an elevational view of the grommet; and

[0023] FIG. 6 is a cross-sectional view of the grommet through the center.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

[0024] Referring now to the cross-sectional view in FIG. 1, there is illustrated hand wheel assembly 10 comprised of an exterior hand grip 12 with peripheral sidewalls 14 forming a recessed cavity 16 on the underside of grip 12. Sidewalls 14 are preferably provided with a surface and shape suitable for secure manual gripping. Disposed within cavity 16 is an integral downward depending annular sleeve 18.

[0025] Hand wheel assembly 10 is attached to a valve stem 20 by a fastener 22. A grommet 24 is attached to the upper portion of a valve bonnet 26. Grommet 24 may be affixed by any number of means, although preferably by an interference fit. Grommet 24 may be of a brightly contrasting color for enhanced visibility, or of a neutral or metallic color, so long as it is visible to the operator. A groove 28 may be precisely machined or otherwise formed in valve bonnet 26 corresponding to the limit of travel of stem 20.

[0026] In the preferred embodiment, stem 20 is threadedly engaged with a valve actuator 30. Valve 32 is actuated by rotation of hand wheel assembly 10 attached to stem 20, causing stem 20 to move linearly in and out of valve bonnet 26. There may be alternate means of actuating the valve other than by a threaded stem, and the present invention will accommodate any linear moving valve stem having a fixed closed position.

[0027] An annular sleeve distal end 34 projects at least as far as sidewalls 14, and preferably slightly beyond sidewalls 14, in order to enhance the visual contrast between sleeve 18 and the grommet 24. Distal end 34 may be tapered outwardly to complement a beveled surface 36 of

grommet 24. Furthermore, sleeve 18 must encompass grommet 24 with a close tolerance in both the vertical and horizontal planes in order to achieve accurate indications of position. Grommet 24 must become exposed upon the slightest opening of valve 32 so as to properly indicate position. In a pressurized gas tank, fluid communication occurs upon the slightest opening of the valve seat, and a greater degree of displacement of the valve does not appreciably affect the rate of flow.

[0028] A bottom plan view of the valve indicator in valve closed position is depicted in FIG. 2. In the preferred embodiment, exterior handgrip 12 has fluted peripheral sidewalls 14 to provide a suitable gripping surface. Inside the periphery of handgrip 12, annular sleeve 18 is projects downward to cover grommet 24 surrounding valve stem 20.

[0029] FIG. 3 depicts the appearance of the valve position indicator when valve 32, with an inlet 38 and an outlet 40, is in the closed position. As valve 32 is closed, valve stem 20, as depicted in FIG. 1, is rotated downward into a valve body 42 to its maximum point of travel. Sleeve 18 is thereby drawn toward valve bonnet 26. When the valve seat (not shown) closes, grommet 24 is completely concealed within sleeve 18. The disappearance of grommet 24 indicates that valve 32 is in the closed position. Grommet 24 may be colored to provide visual contrast with the metallic valve material, or of the same or similar material as the valve, so long as the grommet is visible when the valve is open.

[0030] FIG. 4 depicts the appearance of the valve position indicator when valve 32 is in the open position. As valve 32 is opened, valve stem 20, as depicted in FIG. 1, extends as it is rotated away from valve bonnet 26 thereby moving sleeve 18 of hand wheel assembly 10 away from valve bonnet 26 to expose grommet 24. The visual appearance of grommet 24 indicates that valve 32 is in the open position.

[0031] Referring next to Figs. 5 and 6, a preferred embodiment of the invention shows the grommet 24 having a groove 46 scored in the grommet 24 to form a breakaway portion 44. Groove 46 is scored in a concentric circle between the outer perimeter 52 of grommet 24, and the hollow inner core 50. The groove 46 preferably is scored just inside of the inner radius of annular sleeve 18. When the valve 32 is in the closed position, the breakaway portion 44 will be

in contact with, or very closely proximate to, annular sleeve **18**, such that the grommet **24** will be concealed from view by the beveled surface **36** of distal end **34**.

[0032] After repeated uses, the metal stem **20** will begin to wear, causing the position that corresponds to the valve closed position to shift slightly downward from the original closed position. The interference fit between the valve body **26** and grommet **24** will allow the grommet, in normal operation, to adjust itself in response to downward pressure applied by sidewall **18**, by sliding downward on the valve body to the new "Off" position of the valve stem. However, in the event that the grommet is frozen and fails to move with the valve operator, the breakaway portion **44** will shear away from the grommet **24**, to allow the valve to close without interference. The shear point **48** on the grommet **24** is formed at the bottom of groove **46**, at a point along the radius less than the inner radius of sleeve **18**, such that the remaining portion of grommet **24** will not interfere with the vertical travel of the sleeve. The breakaway portion provides an additional safety feature by preventing the grommet **24** from obstructing the valve **10** from completely closing. The breakage of the breakaway portion **44** serves as an indicator to the operator that the valve has worn, signaling that the valve is in need of repair or replacement, or that the visual indicating grommet **24** may need to be manually adjusted.

[0033] Referring to Fig. 6, a sawtooth surface **56** may be provided as a gripping means on the inner radius of grommet **24** to supply additional gripping strength between the grommet **24** and the valve body **26**. The sawtooth surface **56** prevents unforced slippage of grommet **24** on the valve body. The sawtooth surface **56** also ensures that the grommet **24** will not be "pulled" upward if the grommet catches on, or sticks to, the sleeve **18**.

[0034] Preferably, the teeth in the sawtooth surface **54** have substantially horizontal top edges, and angled bottom edges, to bias movement in the downward (or valve closed) direction and resist movement in the upward (or valve open) direction. In that way, movement of the grommet will only occur one direction, downwardly, as the valve wears, and will not move upwardly under normal operation. Other surfaces may be employed as gripping means, such as a knurled surface, or other irregular finish that effectively engages the valve body. Also, the sawtooth surface may be continuous about the grommet's inner radius, or may be segmented into sawtooth sections.

[0035] As demonstrated by the detailed description of the preferred embodiment, the improved arrangement of the present invention allows the user of the valve to readily determine whether the valve is in the open or closed position. The simplistic construction achieves long-term performance of the indicator at a nominal cost of production.

[0036] According to the provisions of the patent statutes, we have explained the principle, preferred construction, and mode of operation of the invention, and have illustrated and described what we now consider to represent its best embodiments. However, it should be understood that within the scope of the appended claims and the foregoing description, the invention may be practiced, otherwise than specifically illustrated and described.